fires was at times very dense, and it gave an unnatural aspect to the sun and sky, dimmed visibility, and had a general depressing effect upon the people.

No windstorms occurred and no warnings were issued. Near the close of the month it became cooler and frost warnings, which were partially verified, were issued for eastern Oregon and southern Idaho.—*E. A. Beals, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

Several storms passed over the Lake region during the month for which warnings were issued, but no destructive storms causing any serious amount of injury to traffic occurred. On the 9th storm warnings were issued for a storm which developod over the Missouri Valley; on the 19th for a storm then central over northern Illinois; on the 24th for a storm then central over Minnesota, and again on the 29th for high northeast winds. In addition to these warnings, advisory messages were sent on two or three occasions.

Frost warnings were sent to the cranberry-growing region of Wisconsin on two or three occasions.—*F. J. Walz, District Forecaster and Inspector.*

SOUTH PACIFIC FORECAST DISTRICT.

The season has been an unusual one in the southwestern portion of the United States. While a reasonable precipitation may be expected along the Mexican boundary during July, August, and September, averaging 6 inches in southeastern Arizona, 2 inches in northern Arizona, and about 0.6 of an inch in western Arizona, with variations depending upon the altitude of the mountains, it is quite unusual to have precipitation in excess of the above figures. In the year 1889, during July and August, the rainfall in southeastern California, Arizona, and probably northwestern Mexico was excessive. It is believed that the year 1871 was a year of excessive rainfall. The present season has been marked by an unusually large number of thunderstorms, cloudbursts, and subsequent washouts. During the months of July and August, 1889, the rainfall at Flagstaff, Ariz., for example, was 5.65 inches, while for the same period during the current year the rainfall was 12.29 inches. Transportation companies, particularly the Atchison, Topeka, and Santa Fe Railroad, and the Southern Pacific Company of Arizona, had great difficulty in operating, and at some points trains were stalled for a period of five days. No sooner was the roadbed repaired than another heavy rain would again wash it out.

The pressure distribution during this period will, doubtless, show, when charted, an extensive trough of low pressure, reaching from the Valley of the Colorado northeastward through Colorado and Wyoming.

The month was a quiet one, on the whole, in northern California, and also along the coast north of Point Conception. In the Sierra Nevada and in the mountains of southern California, thunderstorms occurred nearly every day during the month. There were no storm warnings issued. A thunderstorm occurred at San Francisco on August 24. No rain had previously fallen on this date for forty years. On the same date thunderstorms were reported generally in the Sacramento Valley.—*Alexander G. McAdie, Professor and District Forecaster.*

WEST GULF FORECAST DISTRICT.

August weather presented no unusual feature. No conditions appeared that called for special warnings.—*I. M. Cline, District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

Warnings were issued to points in Wyoming twenty-four hours in advance of the frost that was general in that State on the morning of the 22d. Cool nights were common throughout the district, but the feature of the month was the unusually large number of local thunderstorms with heavy downpours or cloudbursts. These were confined principally to the mountain and foothills districts, and, while the increased water supply was of great value to irrigation interests in the Plains region, the benefits were offset by loss of property along the upper courses of the streams. The railroads in Arizona, northern New Mexico, and southern Colorado suffered serious interruptions to traffic and large pecuniary loss by the washing out of roadbeds and bridges. The cloudburst of the evening of the 7th caused a terrible loss of life by drowning in the flood that swept down an arroyo, 1 mile north of Eden, a station on the Denver and Rio Grande Railroad, 8 miles north of Pueblo. The bridge at this point, weakened by the flood that was sweeping down the valley, gave way under the weight of a train, dashing all but the sleeping cars into the torrent and drowning the occupants; of these the bodies of 89 were recovered. The bridge had an opening of 758 square feet for the draining of the watershed, which has an area not exceeding 12 square miles of rolling country, in which the maximum elevation is 300 feet. The volume that was emptied into Fountain Creek, near by, was not measured, but it was enormous, considering the small drainage area. At the Santa Fe Bridge, 1 mile to the westward, where the area drained is correspondingly smaller, the volume was about 8300 second-feet.—*F. H. Brandenburg, District Forecaster.*

RIVERS AND FLOODS.

During August the usual summer conditions of comparatively low water prevailed over the various watersheds of the country, except in the Southeastern States, where there were some decided rises due to heavy local rains. The stages reached, however, were not abnormal and, except along the watershed of the Alabama River, the results proved rather beneficial than otherwise, especially to the navigation interests. Warnings of the approaching waters were issued at opportune times, and they were well verified. Along the Tallapoosa, upper Coosa, and Alabama rivers the warnings were issued in ample time to allow the planters to throw up temporary levees across low places in the river banks, and they were thus enabled to keep out the flood waters that would otherwise have overflowed the grain and cotton fields in the lowlands. It is estimated that crops to the value of $25,000 were saved as a result of the warnings, while the losses of those that could not be protected probably amounted to twice as much.

Along the upper Tennessee River timely rains during the first week of the month permitted the resumption of navigation on the 6th, and for two weeks after a sufficient supply of water for steamboat traffic was maintained by the aid of almost daily showers.

The highest and lowest water, mean stage, and monthly range at 213 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during August are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Weather favorable for corn and minor crops, except too dry north and west, though cotton made fairly good progress in those